REENGINEERING JOINT SPECIALIZED UNDERGRADUATE PILOT TRAINING

GRADUATE RESEARCH PROJECT

David R. Hauck, Major, USAF

AFIT/IMO/ENS/09-02

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/IMO/ENS/09-02

REENGINEERING JOINT SPECIALIZED UNDERGRADUATE PILOT TRAINING

GRADUATE RESEARCH PROJECT

Presented to the Faculty

Department of Operational Sciences

Graduate School of Engineering and Management

Air Force Institute of Technology

Air University

Air Education and Training Command

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics

David R. Hauck, BS, MAS

Major, USAF

June 2009

AFIT/IMO/ENS/09-02

REENGINEERING JOINT SPECIALIZED UNDERGRADUATE PILOT TRAINING

David R. Hauck, BS, MAS
Major, USAF

Approved:

//SIGNED//	10 JUNE 2009
William A. Cunningham, PhD (Advisor)	Date

Abstract

The purpose of the following research was to identify shortfalls in the current USAF joint specialized undergraduate pilot training (JSUPT) system and illustrate potential reengineering alternatives for future training programs to provide the United States Air Force the best possible graduate pilots. The three alternatives for future training programs included the current program (JSUPT), an extended T-6 only option, and a return to generalized undergraduate pilot training (UPT). After interviewing subject matter experts from various backgrounds in the Air Force, the author recommended returning to a generalized pilot training program. The overriding factors that favored the generalized UPT system included assignment flexibility, product quality, and consolidated logistics support costs. Future research should be directed at defining the requirements of the follow-on T-38 trainer (T-X). Both airframe acquisition requirements and syllabus specifics need to be addressed to maximize the effectiveness and efficiency of the generalized UPT system.

Acknowledgements

I would like to express my gratitude to my academic advisor, Dr. William Cunningham, for his guidance and sage advice on my graduate research project. I would also like to thank Colonel Oates, A3F, for his sponsorship and access to his AETC experts and data.

Table of Contents

List of Figures

Figure Page

REENGINEERING JOINT SPECIALIZED UNDERGRADUATE PILOT TRAINING

I. Introduction

Current Air Force manning levels indicate a shortage of 2,000 pilots. As of May 2008, according to Headquarters Air Force (HAF)/A9, Studies & Analyses, Assessments and Lessons Learned, manning projections will be 7.8% below requirements through 2018 (Steckbeck, 2008). One solution to overcoming the shortfall is to increase production from undergraduate pilot training. In today's fiscally constrained environment, this simply is not a viable option. As a result of BRAC, the pilot training bases were reduced to Columbus, Vance, and Laughlin Air Force Base (AFB). Additional training is accomplished at Sheppard AFB, Naval Air Station (NAS) Whiting and NAS Corpus Christi, but the majority of USAF Specialized Undergraduate Pilot Training (JSUPT) is conducted at the above three locations. Because of the consolidation of bases, airplanes, instructors and airspace, pilot production is limited to approximately 1,100 pilots per year. Coupled with the production limitations, increased requirements in intelligence, surveillance, and reconnaissance (ISR), special operations, and unmanned aerial systems (UAS) necessitates a look at reengineering JSUPT.

Background

The JSUPT system was implemented in 1992 to tailor training to meet the needs of the major operational commands, but the ever-changing demands of a post-9/11 world indicate specialized training may have had deleterious effects Air Force-wide. From 1959-1992, all Air Force pilots were trained in a generalized UPT format. Generalized UPT provided all students with essentially the same training and produced a product that after a brief transition period could fly any of the Air Force's aircraft (Emmons, 1991).

Since 1992, USAF pilots have been trained in a more specialized manner. All students start in a primary aircraft, the T-37 Tweet, T-34 Turbomentor, or the T-6 Texan II. After learning the basics of takeoff and landing, aerobatics, formation and instrument flying, student pilots are tracked into follow-on advanced training. The tanker/transport track trains in the T-1 Jayhawk, a business-type multi-engine jet. The fighter/bomber track continues training in the T-38 Talon, a high-speed advanced maneuverability trainer. Helicopter students transfer to Ft. Rucker and fly the UH-1 Iroquois and C-130 student pilots transfer to NAS Corpus Christi to fly the T-44 Pegasus. Students are tracked based on performance in the primary training phase as well as personal preference and leadership vectoring. Prior to 1992, all students flew the T-37 in primary and continued to the T-38, regardless of what weapon system they would eventually be assigned.

The goal of specialized training and the Air Force's decision to pursue JSUPT was based on several factors. From 1939-1959, the Air Force trained pilots according to a specialized approach. Students were exposed to different curricula depending on their follow-on assignments in either single or multi-engine aircraft.

> Changing the thrust of pilot training had far-reaching ramifications and was not a decision the Air Force made hastily. In the 1950s, and again in the 1980s, the Air Force made the decision to change the way it trained its pilots only after a deliberate and probing series of studies. In both instances, a common, central factor influencing the decision was the need for new trainer aircraft. Moreover, the studies concluded that SUPT would lower attrition and produce a higher quality, more motivated pilot at less cost than generalized UPT. (Emmons, 1991)

There are two assertions made by Emmons this research intends to investigate further—cost and quality. The cost of a graduate is objective, but the quality of the product is highly subjective. Through a series of interviews with training professionals, MAF and

CAF leaders, United States Air Force Reserves, and logistics personnel, the author intends to search for a future pilot training solution.

Due to the fact that present training schedules have been unable to meet the warfighter's needs for pilot production, an alternative approach may be needed to solve the deficit of rated manning. In 2005, Chief of Staff of the Air Force, Gen Michael Moseley, requested all Major Commands (MAJCOMs) identify processes across the Air Force that could be improved to "Generate savings within our constrained budget that can be applied to the pressing need of recapitalization" (Chief of Staff and Secretary of the Air Force, 2005). This research will address concepts of Business Process Reengineering (BPR) and AFSO21 as it applies to JSUPT. While the research is not focused on saving money, per se, it is intended to determine the best available process to produce a product acceptable to all MAJCOMs while maximizing efficiency in training.

Problem Statement

According to Business Process Reengineering (BPR) experts, Hammer and Champy (2003), 21st century organizations need not organize work around division of labor, or specialization. Instead, modern companies should focus on process-oriented organizations. "Companies today consist of functional silos, or stovepipes, vertical structures built on narrow pieces of a process…People involved in a process look inward toward their department and upward toward their boss, but no one looks outward toward the customer" (Hammer and Champy, 2003). Classical organizations that specialize work and fragment processes tend to resist change because they stifle innovation. The USAF has essentially trained pilots the same way for over 70 years and the culture of the USAF resists wholesale change. Recent developments such as the end of the Cold War,

the attacks of 9/11, and the proliferation of extremist radicalism have necessitated the need to rethink how the Air Force trains pilots to meet warfighters' needs. Within fiscal constraints, the UPT system needs better processes that focus on flexibility, meeting customer needs, while maximizing quality graduates. The research intends to determine if a reengineered UPT system would produce the correct number and mix of USAF pilots to meet warfighter demands and what the future process would look like.

Research Focus

This study will focus on the current and future Undergraduate Pilot Training process from Phase II (primary T-6 training) to Phase III (specialized track: T-1, T-38, T-44, UH-1). There are numerous tie-ins that will be discussed in the areas for further research, but neither Initial Flight Screening (IFS), Introduction to Fighter Fundamentals (IFF), nor RTU training will be researched. The primary research tool will be interviews with subject matter experts (SME) to determine if and how a reengineered undergraduate pilot training system would operate.

Research Objective and Questions

The primary goal of the researcher is to search for a consensus from SMEs and customers (the warfighters) as to the most efficient, effective, and cost advantageous way to train undergraduate pilots to meet current and future manning levels without sacrificing quality. Specific interview questions will address the shortfalls of the current system as well as alternative options for future success. Critical piloting skills will need to be defined and a description of a new process-oriented training program will be discussed.

Assumptions/Limitations

One limitation of this research is the undergraduate helicopter training pipeline. Air Force Helicopter pilots start their training in the same primary aircraft as fixed-wing pilots. After flying the T-6, helicopter students track to Ft. Rucker to complete rotary-wing training. This study will not analyze the methodology for training helicopter pilots due to the vast differences in training environments as well as future flying opportunities for rotary-wing pilots.

A critical assumption is pilot production cannot be resolved by opening new bases. BRAC decisions were made to consolidate resources such as airplanes, maintenance capabilities and airspace. Without Congressional action, opening new bases is not seen as a viable alternative.

Other limitations assume, regardless of the recommended method of training, the quality of the graduates must remain constant. The type and number of airframes will not increase, nor will the timeline for training. A final assumption includes safety. The safety record of any recommended programs needs to equal or better the existing safety statistics.

Implications

The implications of this study are far reaching. Because of rated manning shortfalls, numerous staff positions are being shortfalled. This has a two-fold effect. One effect is staffs do not receive the experience mix required to further USAF objectives in a joint arena or focus decision makers in support of air operations. The other effect of shortfalling rated staff positions is limiting officer career development. If rated officers are unable to obtain staff jobs, instead filling flying billets, career enhancement is stifled

due to a lack of breadth of experience. In today's joint community, the professional Air Force career officer will be at a huge disadvantage when competing for higher-level joint staff positions.

Specifically related to reengineering JSUPT, implications could range from cost savings to morale shifts. If the study determines UPT can be accomplished in an extended T-6 only program in 75% of the time, there could be huge cost and time ramifications. Conversely, 21st century pilot training students may not be motivated to complete a more rigorous, generalized UPT structure resulting in a higher washout rate and thus increased costs.

Due to the timing of this study, the acquisition of a T-38 replacement is another potential key implication. If a decision is made to replace the aging T-38 with a multi-million dollar fighter lead-in, a whole new generation will be trained according to the in-place methodology. If the study yields a smarter way of doing business, acquisition, research and development, and future life cycle costs could be avoided.

II. LITERATURE REVIEW

History of USAF Pilot Training

The literature review will focus on four key areas: the history of USAF pilot training, comparisons to other successful pilot training programs, Business Process Reengineering (BPR)/Air Force Smart Operations 21 (AFSO21), and future recommendations from a Flying Training Transformation (FTT) perspective. The first topic pertains to the history of Air Force pilot training beginning in 1939. This was the first year a specialized pilot training went into effect.

According to Richard Emmons, Air Education and Training Command's (AETC) Historian, the USAF followed a specialized UPT approach from 1939-1959 (1991). The specialized curriculum exposed students to different syllabi depending on whether or not they would fly single or multi-engine aircraft after graduating from UPT. On 24 Jan 1959, the last B-25 class graduated at Reese Air Force Base (AFB), thus ending JSUPT. Generalized UPT was the new training model of choice.

In the 1980s, the Air Force initiated studies to determine if reintroducing JSUPT would enhance training. The factors cited for reestablishing a specialized approach were lower attrition, higher quality, more motivated pilots at less cost than generalized UPT (1991). As a result of these studies and the desires of AF leadership at the time, a decision was made to proceed with JSUPT again. The first T-1A Jayhawk, designed for tanker and airlift pilot training lead-in, was delivered to Reese AFB, in January 1992. Specialized student training began in 1993 (www.globalsecurity.org/military/systems/aircraft/training.htm, 2008). Pilot training today still consists of a specialized approach. All student pilots enter JSUPT and fly the

T-6 for the primary portion. The students are then tracked to either fighter/bomber, tanker/transport, C-130 or helicopter pipelines. Track selection to one of the pipelines is based on student preference, performance in flying and academics, and flight commander recommendations.

While the decisions in the 1950s and 80s to flip-flop between a generalized and specialized UPT were not taken lightly, many of the same issues facing today's USAF have been witnessed before. Headquarters Air Force (HQ AF) studied an alarmingly high attrition rate in the seven pilot training classes in 1950. That study showed that over 90 percent of those attrited were eliminated prior to advanced training (Emmons, 1991). Additionally, motivation was cited in 27.75 percent of those that did not complete pilot training. Because of these factors, the study team concluded that "All pilot training should be built around the assumption that each student was being trained to fly a jet fighter in combat" (1991). In 1959, the transition was complete and USAF pilots were trained in the T-37 Tweet for primary and the T-38 Talon for advanced training. For the next 31 years, generalized pilot training was in effect.

Not even five years later, HQ USAF tasked Air University to study generalized versus specialized UPT. This was the first of several studies that were conducted throughout the sixties, seventies and much of the eighties. During the late 1960s, pilot production goals varied widely from 1,900 in 1966, to almost 3,500 in 1969, and over 4,300 in 1971 (1991). These variations in production estimates made it difficult to assess the best way to train student pilots since cost, schedule, and resource availability varied wildly. To help forecast pilot production, HQ USAF directed Air Force Systems Command to conduct a mission analysis study of UPT requirements. The request was

delivered in January 1969 and by early 1971, with contractor support, two recommendations were prepared. The Northrop Corporation favored the continued use of the generalized UPT system. On the other hand, Lockheed Aircraft Corporation proposed a specialized UPT course of instruction for the USAF. Lockheed's proposal suggested replacing the T-37 and T-38 with a single airframe, but different syllabi for fighter, attack, interceptor and reconnaissance (FAIR) and tanker, transport and bomber (TTB). The Air Force System Command (AFSC) did not make a report to HQ USAF until the fall of 1972. AFSC solicited comments from the Military Airlift Command (MAC), Strategic Air Command (SAC), Tactical Air Command (TAC), and Air Training Command (ATC). Surprisingly, all the commands agreed to keep the generalized system in place (1991).

In 1974, then HQ USAF Deputy Chief of Staff, Personnel, Lt Gen John Roberts stated, "The Air Force goal has been to produce a universally assignable pilot from UPT; however, today's budgetary constraints may dictate that we change that policy" (1991). Momentum was starting to shift back towards a specialized version of UPT. In yet another study, ATC delivered a report to HQ USAF in 1976 that compared the existing generalized system to a specialized two-track program. The study reported the Air Force could realize cost savings and training benefits with a two-track system, provided it could acquire a multi-engine aircraft with improved fuel consumption. However, the report concluded because of budgetary constraints, low UPT production, and the high-quality UPT graduate favored retaining the generalized system that produced a universally assignable pilot.

By 1976, Gen Roberts had taken over ATC as Commander. He was a strong supporter of specialized training. In an interview several years after leaving the service, Gen Roberts was quoted as saying:

> I had a personal feeling when I was in the Pentagon, as well as after I got to the Air Training Command, that sending everybody through the same training program was wrong…It doesn't make a lot of sense….We actually train people to be a fighter pilot, and then all of a sudden, only 25 percent of them get to fly fighters, and we have 50 to 75 percent disappointed….I suggest that we are doing it backwards. We ought to recruit people to fly airplanes by type before they ever step in a trainer aircraft….We will get to that type of training someday. We have to for economy reasons, but also we can do a lot better job of training by training in that manner (1991).

General Roberts formally reported to the Vice Chief of Staff of the Air Force the only training system that optimized quality and cost was a specialized UPT. Because of Gen Roberts' position and influence, ATC was now in favor of returning to a specialized approach to UPT. This was a turning point toward SUPT, although SAC and TAC commanders spoke out against the idea.

On 28 July, 1982, the Air Force Chief of Staff approved a general operational requirement document for SUPT, officially moving the Air Force towards a specialized training program. From 1980-1985, there were numerous concepts and details that had to be worked out to make SUPT a reality. Some of the details included: basing considerations, track selection programmatics, and whether to lease or buy new aircraft. During this time, the AF was also moving forward with plans to procure a replacement for the aging T-37. A production T-46, manufactured by Fairchild Republic, was rolled out 11 February 1985. In September of the same year, funding was deleted due to tighter congressional funding limits. The future tanker/transport system was slipped as well. These two events meant a slip of almost 5 years to the implementation schedule of SUPT

(1991). In essence, the concept of converting from generalized back to specialized training started in 1964, but due to budget constraints and intra-command fighting, implementation was delayed until 1993.

Another reason JSUPT implementation was delayed was due to Congress requesting a master plan outlining how the Air Force intended to proceed. Congress directed the Secretary of Defense to submit a plan which specifically addressed such factors as equipment requirements, estimated costs, the projected implementation schedule, and the acquisition strategy (1991). In April 1988, ATC produced the USAF Trainer Master plan. The master plan analyzed the costs and reliability and maintainability (R&M) factors. The conclusions from this late 1980s plan are vital to the conclusions of the remaining paper.

> While there are any number of ways the Air Force can train pilots, all approaches are not equal. They are not equal in the quality of training…Some produce a more qualified, better trained pilot than others. Nor are all approaches equal in their procurement and subsequent operating and support costs. Some are cheaper to acquire. Some are cheaper to operate. It is rare that one has the option of acquiring a system that is simultaneously best in all respects. Of all the options examined, SUPT promises to provide the highest quality graduates. SUPT is also the least costly training system to acquire and to operate (1991).

The following research attempts to determine if that answer still applies in today's environment.

Additional supporting factors for JSUPT include flying time for student pilots and R&M savings. Under UPT, students received 80.9 flying hours in the primary aircraft and 108.8 in advanced training. In a JSUPT system, primary flying hours increased to 89.0 flying hours. In the Tanker/Transport, advanced flying hours increased to 128.5 hours, while the Bomber/Fighter track received 119.2 hours. Additionally, because of the

seating configuration of the Tanker/Transport trainer, students received 109.5 hours of observer time in the third seat. Despite the increase in hours for both tracks, the AF expected to realize savings in operations and support costs—a full 20% in fuel and maintenance. Reliability and maintainability were also expected to improve due a 16.5% reduction in aircraft required to produce the same amount of flying hours (1991). In fuel costs alone, the expected tanker/transport aircraft was expected to save 40%. With current JSUPT training allocations, nearly 75% of primary students track to the tanker/transport aircraft. Clearly with these set of conditions, JSUPT seemed a logical choice.

Comparison of Alternative Training Programs

Regardless of the process in which the USAF trains its student pilots, the Air Force has been widely recognized as having some of the best trained pilots in the world. And while the USAF currently employs a specialized training approach, there are other services and other countries that train their student pilots according to differing philosophies. For comparison, the following three pilot training programs are described: the United States Navy, the Israeli Air Force and the Swiss Air Force.

The United States Navy's (USN) pilot training program is very similar to that of the USAF. Student Naval Aviators (SNAs) progress through a highly specialized syllabus with training lengths varying from 18 months to two years (https://www.cnatra.navy.mil/training_pilot.htm, 2009). Just as in the USAF, naval students undergo flight screening and all students attend primary training in one aircraft. The primary training occurs in the T-34C Turbo Mentor and lasts approximately six months. Flying training consists of the following seven stages: familiarization, basic

instruments, precision aerobatics, formation, radio instrument navigation, night familiarization and visual navigation (2009). Once complete with primary, the SNA is tracked to one of four paths. Selection is based on needs of the service, student performance and lastly SNA preference. A small number are selected for further training with the Air Force in the T-1 Jayhawk. Others are selected for multi-engine propeller and are assigned to fly the T-44A Pegasus or the TC-12 Huron. Another small percentage of SNAs are selected to fly the tail hook syllabus in the T-45A or T-45C. A majority of SNAs are assigned helicopter training in the TH-57C. Those selected for the tail hook syllabus are again screened for follow-on training after 58 sorties and approximately 27 weeks (2009). At the completion of the tail hook syllabus, approximately 70% are selected for Advanced Strike training, leading to tactical jets. This path is most similar to an AF student that flies the T-6 in primary and the T-38 in advanced. The advanced strike syllabus is an additional 67 flights lasting 23 weeks. Once a SNA completes their advanced training, they are assigned into their Fleet Replacement Squadron for aircraft-specific training. Roughly 1,000 pilots graduate each year (2009). For comparison purposes, the USN uses five specialized advanced training aircraft/pipelines compared to the USAF's four.

The Israelis, on the other hand, use a more generalized UPT than the USAF or USN. They also focus more effort on pilot selection techniques. The Israelis recruit and invite only those thought to possess the innate ability to succeed in what can be seen as the world's most demanding military selection course. Potential pilots are marked out several years before reporting for national service at the age of 18. The following factors are used to screen potential candidates: high scores on standardized tests, excellent

physical condition and loyalty to state. Those that meet these and other criteria are invited to a six-day gibush, or cohesion test. The candidates are given physical, mental and sociometric challenges and are screened based on the ability to perform the tasks as well as their attitude in success or failure (http://www.nationmaster.com/encyclopedia/Israeli-Air-Force, 2009). As many as 90 percent who commence the gibush are dropped from further consideration. Those that do pass begin a three year training program that consists of officership, academics (degree) and pilot training. At each stage, more and more recruits drop out due to the challenging curriculum. For the few dozen that make it to graduation, only those with the highest academic and leadership scores will train as fighter pilots. The remainder train to fly helicopters or transports. The initial aircraft used in the screening process is the German-built Grob G-120A. Following initial sorting, students fly the Israeli Aircraft Industries CM-170 Tzukit, a jet-powered trainer put into service in 1983. The Israeli Air Force uses the McDonnell Douglas A-4 for advanced jet training, the Beechcraft Bonanza King Air 200 for transport training and a Bell helicopter variant for helicopter training (http://www.iaf.org.il/Templates/Aircraft/Aircraft.IN.aspx?lang=EN&lobbyID=69&folderID=81&docfolderID=901&docID=20575&currentPageNumber=6, 2009). This combination of extremely difficult screening coupled with high-quality generalized training has led to Israel being one of the premier Air Forces in the world today.

A further example of generalized training can be seen with the Swiss Air Force. Although not regarded as one of the best military Air Forces in the world, the Swiss AF does operate sophisticated fighter aircraft such as the F-18 Hornet. The Swiss have expanded on the idea of a generalized training process by procuring a single airframe for

cradle-to-grave pilot training. The Pilatus PC-21 (Swiss-made) was designed to fulfill the requirements for basic, advanced and fighter lead-in training (http://www.airforce-technology.com/projects/pc_21/, 2009). "The aircraft combines the procurement and operating costs of current-generation turboprop aircraft with jet training capability. It has a high wing loading that is more characteristic of a jet and the engine's power output is scheduled by using a sophisticated power management system" (2009). The performance and operating characteristics are similar to the USAF's primary trainer, the Beechcraft T-6 Texan II. The Texan II is based on the Pilatus PC-7 and provides 1100 shaft horsepower (shp) with a max speed of 316 knots (http://www.af.mil/factsheets/factsheet.asp?fsID=124, 2009). The PC-21 has a 1600 shp motor and is capable of 370 knots max speed.

In addition to the performance improvements over the T-6, the PC-21 has advanced integrated systems and avionics that make advanced training possible with a single airframe. The PC-21 has an operational conversion unit that allows advanced students to learn basic radar intercepts, simulated deployment of smart weapons, and basic night vision goggle usage. The aircraft is fitted with a fully digital glass cockpit with head-up displays (HUD), hands-on throttle and stick (HOTAS) control and full sized multi-function displays (MFD) (http://www.airforce-technology.com/projects/pc_21/, PC-21 Turboprop Trainer, Switzerland, accessed 24 Feb 09). These advancements are able to be turned off during initial training so to not overwhelm a beginning student, but can be introduced as the training progresses. Additionally, the HUD, HOTAS and MFDs provide a similar cockpit arrangement for current generation fighters. The Swiss AF has

adopted this single airframe training philosophy for their future training requirements; the USAF could potentially use this example as a template for its future needs.

Business Process Reengineering/Air Force Smart Operations 21

The USAF has a vested interest in procuring, operating and maintaining the most advanced technologies for aerospace applications. Future fighter, tanker, transport, special operations and helicopter pilots all require highly effective and efficient undergraduate pilot training that employ these advanced technologies. Not only does the USAF require the best technology, but the smart application of training techniques and operating systems. For the past 70 years, the Air Force has been training military pilots essentially the same way. Perhaps it is time to approach the system from a different perspective.

According to Hammer and Champy in Reengineering the Corporation, reengineering is defined as "The fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed" (2003). While the USAF is not a manufacturing business, there are a number of principles that could be applied to UPT to improve the system. Fundamental changes must look at what an organization needs to do, not how it is currently being done. Business Process Reengineering (BPR) ignores what is and concentrates on what should be. In the case of UPT, this focus would be on delivering a professional military pilot to the Combat or Mobility Air Forces with a core set of skills required to continue successful service.

In terms of radical and dramatic changes, companies cannot afford to make incremental or marginal improvements. Radical redesign means getting to the root of the

problem. Disregarding all existing structures and procedures and inventing completely new ways of doing business is analogous to business reinvention. Dramatic means making order-of-magnitude changes to the organizational structure or processes to gain efficiencies. Hammer and Champy believe a truly great company is never satisfied with its current performance (2003).

The final key word in the definition of reengineering is process. A process is a collection of activities that takes numerous inputs and creates an output that meets or exceeds the customer's needs. Many companies or organizational leaders are not process-oriented. Instead, they focus on tasks, jobs, people, or structures, but not on processes. The pilot training process has not changed much over the years and would require radical and dramatic thinking to reinvent the system.

Although many of the concepts discussed in Reengineering the Corporation pertain solely to the business world, there are other concepts the USAF could incorporate to focus a better UPT process. The three C's of reengineering are comprised of customers, competition and change. As discussed earlier, the USAF pilot training product is a graduated military aviator. The producer is Air Education and Training Command (AETC) and the customers are the MAF and CAF. While the MAF/CAF cannot select another producer, they can and should be involved in the process required to provide an overall quality product. Customers demand products and services designed for their unique and particular needs (2003). To reengineer the UPT process, the customers would have to define requirements of a newly minted aviator and AETC would then create a process that meets those needs.

Competition is the second C, but because the USAF is a governmental organization, there is no competition for training Air Force pilots. The competition is instead, global Air Forces and adversaries. China, Russia, Iran, North Korea, and even terrorist organizations have forces trained and equipped to outmaneuver or undermine the competitive advantage of the United States Air Forces. Tactics, technology and terrorism can all be used to defeat American forces in the air and on the ground. New ways of thinking about the enemy may be required to gain or keep the competitive advantage over this "competition".

The third C is change. Change is universal, pervasive and persistent. Just twenty years ago, the United States was focused on the Cold War and the Soviet Union. Since 2001, terrorist networks in Afghanistan and Iraq have been the focus of the United States' Armed Forces. The exact nature and timing of the next threat is unknown. To meet these unknown challenges, the Air Force must be ready and able to adapt to changing environments, while meeting challenging fiscal constraints. One area Hammer and Champy highlight is information technology. State-of-the-art technology is critical in any reengineering effort, but it is only a critical enabler. Technology improvements alone cannot make processes better; the process itself has to be reengineered with the use of IT (2003). AETC can leverage new and emerging avionics and training systems, much like the Swiss AF, as well as improved simulation technologies. The leap in technology from the venerable T-37 Tweet to the T-6 Texan II in primary training was undeniable. Advances in technology and their application to reengineered training systems are necessary for the USAF to succeed in such rapidly changing environments.

AFSO21 Background

The Air Force has recognized the importance of best business practices such as Lean, Six Sigma, Theory of Constraints and BPR. In November 2006, the USAF launched its own version of best practices--AFSO21. Air Force Smart Operations for the 21st century had three objectives: (1) create a standard approach to continuously improve all processes, (2) breed a culture that promotes a reduction in waste and cycle times with an end goal of sharing those that are best practices, and (3) continuously teach Airmen new ways to affect change. The program is based on the AFSO21 Six-Step Continuous Improvement Cycle (Figure 1) that is aimed to improve the entire system, not just an element of the system (AFSO21 CONOPS, 2006).

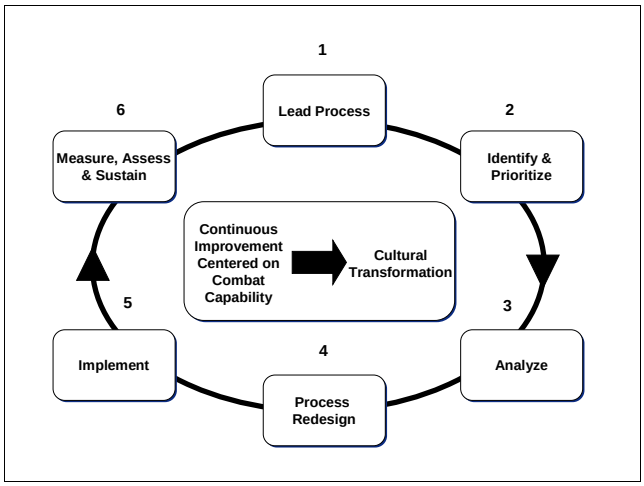

Figure 1. AFSO21 Five-Step Continuous Improvement Cycle (AFSO21 CONOPS, 2006)

AFSO21 takes best practices from four separate quality processes and allows the user to choose individual pieces to affect change. (AFSO21 CONOPS, 2006) From those processes, five methods are presented to the user to decide the best way to improve

a process or system: (1) value stream mapping, (2) constraint analysis, (3) metrics and performance measurement, (4) go and see and (5) risk assessment/capability gap analysis. The AFSO21 Playbook breaks down each situation, what method works best, and a brief description of the tools involved (AFSO21 Playbook, 2006).

AFSO21 is capability focused. In the case of UPT, the capabilities of the graduated pilot must be able to meet standards set by the MAF and CAF. Taking out variability, providing flexibility and reducing waste will ultimately lead to increased combat capability. Some analysis tools and methods used to determine smart ops are analysis of alternatives, cost-benefit analysis and enterprise analysis and action planning (AFSO21 CONOPS, 2006). With the exception of an in-depth cost-benefit analysis, this research intends to use these tools in conjunction with interviewing experts to determine if AFSO21 and BPR can improve the current UPT process.

Flying Training Transformation Perspective

Air Education and Training Command began using AFSO21 concepts to improve their processes. In December 2005, the Chief of Staff of the Air Force directed AETC to form an Integrated Process Team (IPT) to examine how the command conducted UPT with an eye toward transforming it into a more efficient enterprise (AETC History 2006-2007, 2009). In response, Major General Hostage, AETC's Director for Air, Space, and Intelligence Operations (A2/A3), chartered the Flying Training Transformation (FTT) Integrated Process Team in May 2006. The process team consisted of a diverse group. The following were represented: all 19th AF Operations Groups, a number of AETC directorates, several other MAJCOMs, the Air Staff, USN, Air Force Personnel Center, and the AF commissioning sources.

> The IPT dealt with a number of considerations. It wanted to see if AETC could make training faster, better, and cheaper. It also wanted to identify what skill-sets were needed to meet customer requirements and whether the command could move those skill sets to earlier points on the training spectrum. The team committed itself to leverage technology in a disciplined systems approach and, at the same time, wanted to eliminate no-value added ground training, simulator, and aircraft events. In addition, the IPT sought to insert value-added training to promote an operational, AEF mindset and to maintain rigorous training standards. Finally, it recognized that resource constraints had to be a part of the transformation calculus (2009).

To do this, the team focused on three objectives. The first objective was to improve the efficiency of the current UPT system by eliminating non value-added training. The second objective took a near-term look at transforming the way AETC uses proficiency based training models and how it integrated technology into the training process. The final objective was to develop a blueprint for what UPT would look like in 2012.

These objectives, or tasks, were analyzed by training and operational experts to determine the way ahead. The first task attempted to improve system efficiency. To accomplish this, core competencies were identified. These core competencies included: basic flying skills, situational awareness, sensor/task management, decision making/leadership and warrior ethos (Lunsford, 2008). Additionally, the IPT used AFSO21 concepts to eliminate non-value added training as well as challenging today's rule sets. In figure 2 below, the system is described before any actions were taken.

In November 2006, the Operations Group Commanders attended a one-day gathering to review the syllabuses and make adjustments as needed. The group came up

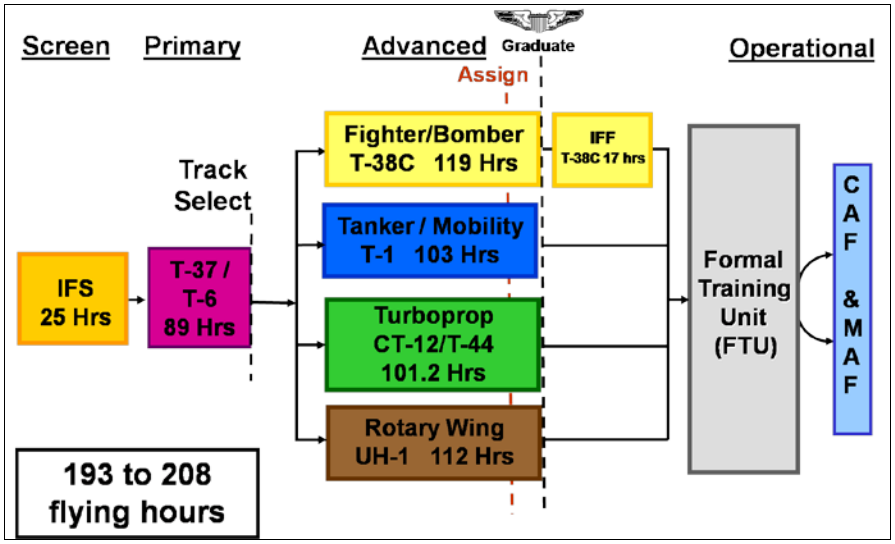

Figure 2. Hours required to complete JSUPT prior to Oct 2007 (Lunsford, 2008)

with initiatives that cut the number of flying hours from the 193-208 range to 166-178 total flying hours. The savings came from substantial reductions in sorties and flying hours in each phase and track. The largest savings came from the T-38 track. Overall, the changes as seen in Figure 3 below, resulted in a savings of 15% (2008).

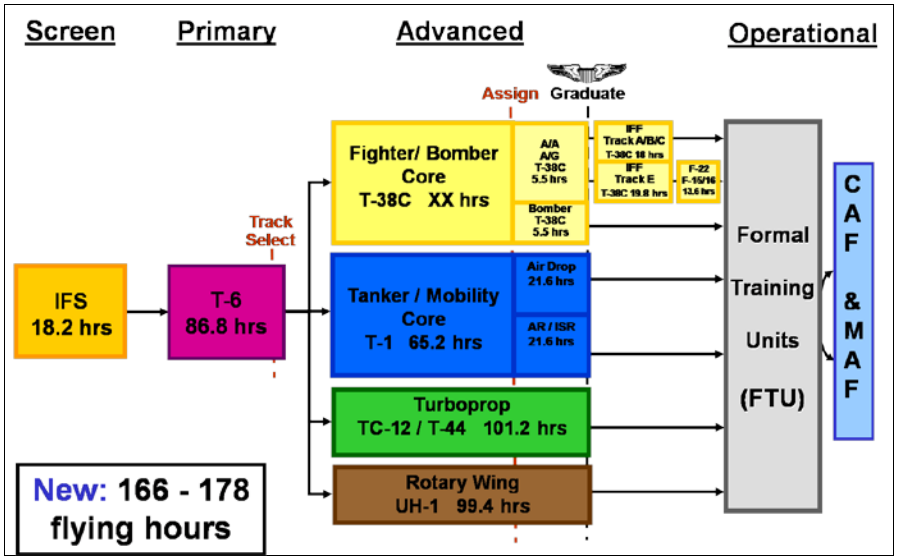

Figure 3. Hours required to complete JSUPT as of Oct 2007 (Lunsford, 2008)

The second task was focused on transforming AETC processes in the near term by developing new courses of action. The two main options varied in their philosophies. The first embraced the idea of creating mini-tracks within the T-6 training environment. All students would receive 60 core hours of instruction and then be tracked to either a missionized T-38 or missionized T-1 vector, receiving another 30 flying hours. Following the T-6 training, the T-38 and T-1 syllabus could be adjusted accordingly to meet user requirements. The advantage of this approach was that it provided the CAF and MAF a more missionized graduate. However there were disadvantages too. Pilots would graduate with minimum core skills, have less assignment flexibility, and would require increased guidance to vector and cross-track (2008).

The alternative option was essentially a generalized UPT model similar to that prior to 1992. The "new" UPT would consist of 100 hours in the T-6 and a 50 hour core skills phase in the T-38. At the end of the 150 hours, students would earn their wings. Fighter pilots would fly another 50 hours in the T-38, while bomber, tanker and transport pilots would fly the T-1 as a lead-in to their future weapon systems. The advantages of this approach was the production of pilots with strong core skills in only 150 hours of training, allowed flexibility in assignments, and eliminated the need for vectoring, track selecting and cross-tracking. The disadvantages were potentially higher attrition rates and a less missionized pilot for the CAF and MAF (2008).

The final task, providing a blueprint for UPT in 2012 was not mentioned in the report, but future efforts will look to identify the training requirements for the F-22, F-35 and KC-X. This research intends to tie together the Flying Training Transformation's work combined with the use of BPR and AFSO21 techniques to provide that roadmap for future pilot training success.

III. METHODOLOGY

Research Design

The research behind the study was based on conducting personal interviews with subject matter experts to garner consensus opinion on the road ahead. The interview questions are included as an attachment in appendix A. Once opinions were synthesized, the concepts of AFSO21 and BPR were applied to determine a solution that best fits the future pilot training needs of the Air Force. The interview was developed by the researcher in conjunction with Dr. William Cunningham. The results of the interviews were compiled and analyzed by the author and the findings will be detailed in section IV.

The researcher contacted the subjects through an email to provide background information about the researcher, the purpose of the interview, and a high level introduction of the questions. This allowed for the interview subjects to think about their potential answers and the ability to set up a convenient time to answer without time pressures. Once a time was scheduled, the researched called the subjects individually. The subjects were asked if the session could be recorded for clarity and detailed analysis. All subjects agreed. The interviews were conducted over a one month period and all but one was completed in a single session. Interview lengths varied from 15 minutes to almost an hour. The length of response depended on the subjects' desire to elaborate on open-ended answers. The average interview lasted 26 minutes.

Comment [A1]: Get rid of all the blue and the underlining

Data Sources

To ensure expertise, the pool of subjects was limited to eleven. The goal was to interview a wide representation of experts. Ten of the eleven subjects were rated, with nine pilots and one navigator. Five were both Department of Defense civilians as well as

retired from active duty USAF. An additional five are currently serving on active duty. Two have served in the guard or reserves. Finally, one headquarters air staff logistician was interviewed. Both the fighter/bomber and tanker/airlift career fields were represented with an even 50% split according to major weapon system flown. The following aircraft were flown by the participants: F-15C, F-16, F-4, B-52, B-1, KC-135, C-5, C-130, and C-21. Additionally, many of the rated personnel flew trainers. All had various levels of staff experience, from Air Education and Training Command to Headquarters Air Force. The average number of flying hours for the rated subjects was 3,267. All but one of the subjects was male. Four of the five active duty officers are currently sitting flying training squadron commanders.

IV. RESULTS AND DATA ANALYSIS

After compiling the information from the interviews, the results and data can be broken down into four areas of analysis. To ensure a system's approach is used to produce the best quality pilot, a valid assessment of what knowledge, skills, and abilities a basic Air Force pilot requires upon graduation is needed. There are several recurring themes that were discussed as it relates to each of the three proposed training approaches and their advantages and disadvantages. Additionally, there were numerous observations from the sample group that led to the ultimate recommendation. Finally, this paper applied AFSO21 and BPR principles to determine their applicability to recreating a successful UPT program for the Air Force.

Knowledge, Skills, and Abilities of Air Force Pilot Graduates

Almost all the rated personnel described the same skill set required for a graduated UPT pilot. Basic flying skills, such as stick and rudder abilities, topped the list. The rationale is, if a pilot is unable to hold straight and level flight, he/she will be unable to do more complicated maneuvers, much less navigate or communicate. The remaining skills were not ranked as a consensus, but most were grouped as being a close second in importance to basic flying skills. Situational awareness, or knowing what is going on around you at all times, was mentioned five times. Decision making, task management and judgment were also rated as being critical for follow-on training success. Situational awareness, decision making, task management and judgment are all grade sheet items throughout UPT. They are also the hardest to assign objective grades. Instructors must assign a grade based upon how a student is interacting with air traffic control and other aircraft, as well as interpreting how the student is reacting to the

dynamic environment around them. The training is a building block approach in which the student is expected to increase proficiency in the above areas, regardless of what new maneuvers are being introduced throughout the program. By the time graduation occurs, the four subjective areas have been developed to a common level to react to an ever-changing environment.

Advantages/Disadvantages of Differing UPT Systems

While the interview subjects varied widely in airframe background and recency of flying experience, there were numerous similarities throughout the answers to the interview questions. This section will be further broken down by specific UPT systems. The extended T-6 program was the most controversial. There was some support for this radical UPT conversion, but the opponents were extremely vocal with their lack of support for such a system. There were 3 supporters for the extended T-6 program, but only two supporters for retaining the JSUPT system. A majority, six of eleven, favored going back to a generalized UPT system.

Extended T-6 Program

An extended T-6 program would take the current primary phase of training, and extend it to accommodate a more advanced syllabus. A follow-on trainer would be considered graduate level training, thereby effectively shortening UPT from a systems' perspective. This approach has several advantages. Students would only have to learn one aircraft during undergraduate training. Once the basics are mastered, the student would be able to focus on the regime of training instead of constantly looking for cockpit switches or improving his/her composite cross-check. The T-6 is also the least expensive aircraft to acquire, maintain and provide logistics support. The subjects interviewed were

unanimous in conveying the T-6 option would be the least expensive. In addition to cost savings, having only one airframe would reduce the time it takes to produce pilots. There would be no transition to a new aircraft halfway through the program. There would be no need for new aircraft academics, simulators or a transition flying piece of the syllabus for the follow-on trainer. The interview subjects felt this system could reduce UPT to as little as 36 weeks compared to 49 weeks currently.

With the recession of 2008-09, it is understandable why the lowest cost option would be attractive. However, the least costly option also had numerous disadvantages cited by the interview subjects, and only three supported this system as the best overall. Although the program could be reduced to approximately nine months, opponents said an extended T-6 syllabus would not be producing a pilot capable of meeting entry-level requirements for the CAF or MAF. Instead, the system would produce a very proficient T-6 pilot. Primary training is intended to level the playing field for all trainees, but without changing to a more advanced aircraft after primary, making an assessment of a pilot's abilities in future systems is limited. Another salient point brought up by several of the respondents revolved around the theory of pay-me-now or pay-me-later. While the T-6 is very fuel-efficient, and therefore less costly to operate, the trade-off potential could be greater in the long run. For instance, if a pilot was allocated 150 hours in the T-6 to earn his/her wings, it would be less expensive than the current JSUPT system. However, if the winged pilot then went on to fly C-5s and required much more training in the C-5 due to a lack of advanced skills, the system training cost would be much greater because the per flying hour cost of the C-5 is much greater than trainer platforms. Most of the interview subjects agreed this system could be implemented. The opponents felt it would

be a risky proposition, because the students would not be tested in a faster, more advanced environment. The increased speed of an advanced trainer, coupled with learning a new system in the short amount of time given at UPT were cited again and again regarding matching the right aviators with their future MWS. Without transitioning to a follow-on aircraft after T-6s, there are too many unknowns with the end product.

Joint Specialized Undergraduate Training

Every respondent felt the current JSUPT system provided a capable graduate to the MAF and CAF. This was the only response that was 100% consensual. That being said, only two of the eleven thought JSUPT was the best system. One of the main arguments for specialized training involved the high-quality end-product. T-1 pilots flow into the heavy community with a heightened sense of Crew Resource Management (CRM) as well as an improved instrument environment acumen. T-38 graduates are able to enter Introduction to Fighter Fundamentals (IFF) with four-ship experience, introduction to tactical maneuvers, and high-speed low-level exposure. Additionally, the students are groomed by the instructor community upon which they are about to enter. This credibility and war-story environment is cited as being a positive influence on morale. A final argument for retaining JSUPT, brought up by one of the respondents, was the improved safety rates since the implementation of JSUPT in 1992. While this may have empirical support, correlation cannot be proven. Safety rates may have improved regardless of what UPT training system was in place.

With 100% support for the current graduates' skills entering the CAF and MAF, why did only two of eleven support retaining JSUPT? There are a few disadvantages to the JSUPT route. When the Air Force leaders decided to implement specialized training,

rated force levels were around 22,000. Today, rated manning is 2,000 pilots short and totals range near 13,000. Until recently, pilots have been trained in their Major Weapon System (MWS) and have remained in that MWS for their entire career. Today's rapidly changing environment now requires more flexibility in assignments that JSUPT does not allow. Once a student has been tracked, he/she will be assigned according to track regardless of performance in the advanced training portion. If a student is a late bloomer, but is tracked to T-1s, there is no chance for him/her to fly fighters or bombers.

Current fighter manning levels have necessitated an almost one year delay from T-38 graduation to entering the MWS-specific schoolhouse. Since students are tracked in the T-6, students that enter the T-38 track cannot be assigned a C-17. That C-17 training allocation may go unfilled because the T-1 squadron is over saturated. Additionally, T-38 students that are assigned Unmanned Aerial Systems (UAS), Intelligence, Surveillance, and Reconnaissance (ISR), or Special Operations aircraft are disincentivized to choose a more difficult track during training. Finally, another disadvantage is the segmentation of the instructor force. By training heavy pilots in one squadron and fighter/bomber pilots in another, there are less opportunities to share operational experiences and crosstalk community ideas.

Generalized Undergraduate Pilot Training

The third option being investigated is generalized UPT. Six of the eleven respondents thought the generalized system was the best overall. The main argument for Implementing a generalized pilot training is the system's flexibility. With a two-tiered training approach, students are no longer tracked to a specialized airframe. This provides maximum flexibility because students are now universally assignable and all students

have the potential to be assigned to any platform regardless of what the Air Force needs are at graduation. Many of the respondents also cited the fact that it is easier to train down. In other words, if a student is trained in the T-X (generic term for future T-38 replacement), in the single-seat mindset, it will be easier to train in a follow-on crew aircraft. Speed was given as the number one factor why the T-X is superior to other training methods. Temporal distortion and compression of tasks requires a greater level of situational awareness, task management and timely decision making.

One issue that can be argued as either an advantage or disadvantage is increased washout rates. One respondent thought implementing a mandatory attrition rate would produce a higher quality pilot. From a corporate perspective, that is a good thing. But from an individual perspective, forced attrition may drive capable candidates out if they are being compared to a strong group of students. If a minimum standard is used, and candidates achieve that level, forced attrition should not be implemented. However, due to the philosophy of training down, increased attrition rates meet both goals. Students will have to perform at a higher level, thus increasing the quality of the graduate for all MWS communities.

From a historical perspective, going to a generalized UPT would most likely increase the attrition rate naturally, providing the same outcome as forced attrition. Many students choose the T-1 because they feel more aligned with the heavy community culture. Some students are more than capable of handling crew duties, but do not respond well to fast-paced formation or tactical maneuvering. This in turn, is related to morale. Those that do not want to fly upside down, or under heavy G-loads would be disincentivized to fly under a T-X syllabus. A final observation opposing generalized

UPT is that of cross tracking. Prior to 1992, the Air Force advertised, and generalized UPT advocates argued, that pilots could cross track into other MWS due to the universally assignable concept. While this may have been the case, the Air Force hardly ever actually cross tracked pilots between communities.

Further Observations

There were several observations during the course of the interviews that provided insight through the numerous years of experience and the personal opinions of the respondents. Some of the observations are directly related to the final recommendation, while others provided valuable information for bettering the UPT process overall regardless of what path is taken. A recurring theme throughout the interview process revealed the quality of the pilot product and flexibility in training are the two most important factors. As stated before, there was no consensus, but those that did not advocate for an extended T-6 program were extremely adamant. The arguments used included mistakes in logic by decision makers trying to save a few dollars. In trying to emulate civilian models or implementing business techniques that are buzz worthy, military pilots can be short changed. Providing "just enough" training does not translate down the road when a pilot is attempting to upgrade to aircraft commander or four-ship flight lead. Laying the foundation early pays off big dividends in the future and can be an investment for a 20 year career. Pilot training is a relatively safe environment, comparatively cheap, and instructor oversight provides both a safety net and a mentoring situation. Learning and making mistakes in that environment is much more forgiving than a war zone.

Another problem with trying to implement a future training solution is the lack of a stable definition of requirements for undergraduate pilot training. A winged pilot is a basic pilot, with a skill set that allows for follow-on training with the CAF or MAF. While syllabis change constantly, the CAF and MAF continually try to push training down to the UPT level. With a finite number of days and flying hours, pushing more and more training down to the UPT level waters down the effectiveness of basic flying training. But, the operational environment is much different now than in recent years' past. With the huge ramp up of ISR, UAS and Special Operations aviation, sensor interpretation and systems' management are much bigger players than cold war fighter versus fighter operations. Future training systems will need to take this into consideration.

AFSO21 and BPR Principles Applied

Based on the researcher's personal experience as a primary flying instructor trainer, coupled with the results of the interviews, there are several AFSO21 and BPR principles that can be used to reengineer the UPT process. According to AFSO21, the generalized system would reduce waste and cycle time due to two factors. The first is the delay in the track selection. Although it sounds counterintuitive to induce a delay to reduce cycle time, the Air Force would be able to assign aircraft later within the pilot training regime, allowing more flexibility when corporate Air Force requirements change. In the JSUPT system, if four students are tracked to T-38s and a new requirement for six MC-12s comes up after track selection, there is a high likelihood those pilots not assigned to MC-12s would be held in queue awaiting F-16 follow-on training.

The second part of the JSUPT system is waste. Graduated pilots, unable to start follow-on training due to fighter over manning levels, are typically employed at the pilot training base doing jobs any Lieutenant could do on casual status. That pilot is not using the newly acquired skills in the cockpit and delaying the return on investment that was just spent. From a purely lean perspective, the extended T-6 program would prevent the most waste, because there would be no gap between airframes and thus a smaller cycle time.

Another AFSO21 principle that applies is the analysis of alternatives. While JSUPT and generalized UPT were discussed in great detail, the single-airframe debate was largely dismissed. Two of the respondents argued the single-track (extended T-6) was a third world training system. That does not mean there are no viable options out there that could be further explored. If a request for proposal was sent to defense contractors stating a requirement to land at variable speeds and allow for time-compression add-ons, perhaps a single-airframe acquisition would make sense. A cost-benefit analysis was not accomplished, but will be recommended in the future research section.

Hammer and Champy have argued success results when there is a complete overhaul of a system. Implementing a single-airframe track would be the most radical, but going back to the dual-track generalized approach would be a large policy shift as well. The three C's do play a large role in determining the best system. Redefining the customer from the MAF and CAF to corporate Air Force puts a premium on flexibility over specialization. Since the Air Force has trained pilots, heavy and fighter communities have had differing philosophies about the best way to administer UPT. If

Air Force leadership can break that tribal mindset and make decisions based on the real customer, a generalized or extended T-6 program makes more sense than JSUPT.

Although stated before, due to the governmental nature of the business, there is no direct competition to the current UPT system. However, the Air Force should continuously evaluate what other dominant airpower countries are doing with their pilot training. Leadership should also constantly be looking for the next threat and how airpower could either eliminate that threat or enable the joint community to overcome the adversary. This philosophy directly ties into the third C, change. While going back to a generalized pilot training approach is not radical, it would require effective communication to alleviate cultural biases. Ultimately the concepts of AFSO21 and BPR should continue to be used to improve the process and provide the increased combat capability espoused by change advocates.

V. RECOMMENDATIONS, CONCLUSIONS, AND FUTURE RESEARCH

Recommendations

The author's recommendation for the future of pilot training is to return to a generalized UPT. While the greatest cost and time savings would be gained by an extended T-6 winging program, there are too many unknowns. There is no debate that the Air Force could implement such a program. The problem is the savings you reap up front flying the very fuel efficient T-6, may cost you more money in the long run retraining in more costly major weapon systems. Additionally, if a student pilot is not further tested with increased speed, more advanced avionics, or crew resource management scenarios, he/she may not have the requisite skills required of a combat aviator. As a result, the pilot could be placed in a MWS that does not match his/her level of ability.

While JSUPT has certainly provided quality pilots to the MAF and CAF since its inception, the Air Force can no longer rely on such a specialized product. Since the rated force has been reduced from 22,000 pilots to 13,000 and the requirements for ISR, UAS and Special Operations has increased greatly, the time for a universally assignable pilot is upon us again. The Air Force culture of graduating UPT and remaining in one airframe or even one community has to be changed. Instead of General Roberts' adage of training all students to be single seat jet fighters, the USAF needs to morph into training generalized Air Force pilots, capable of supporting joint warfighters' demands.

Generalized UPT provides the most flexible and arguably the best product of the three systems. Those two arguments far outweigh any cost or time savings that could be realized in fuel-efficiencies or reductions in supply chains. The Air Force is in the business of effectiveness, not efficiency. And while being fiscally conservative is important, it does not override the skill and flexibility our pilots' require.

Conclusions

The generalized model should consist of the current T-6 primary phase of flying training followed by the T-X trainer. The T-X would provide all pilots a faster, more complex airframe to allow further evaluation in a controlled training environment. Since all pilots would follow-on in the T-X, the assignment system would benefit through flexibility in delaying community assignments. During the last half of T-X training, students would be assigned their MWS according to current corporate Air Force needs. Once assigned, T-X mini-tracks would be flown to better prepare student pilots for their particular community. Pilots would be universally assignable, setting the student's expectation that they are not the customer in the process. With 2 aircraft, the logistics tail would be smaller than the current JSUPT system. Depending on what airframe is selected for the T-X, fuel costs could be comparable to the T-1. While this suggestion is not radical or truly a reengineering effort, it makes the most sense in terms of product quality and force flexibility.

Suggestions for Further Research

Future research should focus on a complete cost-benefit analysis of future alternatives. The complexities of the Air Force's logistics model make it difficult to compare life cycle costs across MWS and base. To truly analyze the cost of a single,

dual or specialized track would require a different focus and in-depth analysis of flying hour costs and contract logistics support.

Another suggestion for further research is directed to fleshing out the requirements of the future T-X trainer. With 85% of pilot training graduates currently going to non-fighter billets, the cost-benefit analysis could include a T-X aircraft that better suits the majority of forces. Those that are selected to fighters would then train in a T-38C or F-16D before going on to F-22 or F-35 aircraft. If the aircraft purchased were multi-variant, the Air Force could possibly use it for ISR or Special Operations in a different configuration.

Finally, this study used 11 subjects in the interview process. A larger sample size might have changed the results. Additionally, if a Delphi study were used, consensus may have been achieved through additional rounds of questioning. Also, representation from the helicopter, UAS, ISR, and Special Operations communities could have provided valuable insight into the project and the future of pilot training. And while there will never be one panacea for the perfect pilot training, the generalized pilot training model offers the Air Force the most flexible and capable product in the current environment and in the near future.

Appendix A: Interview Questions

1. **What is your name?**
2. **What is your rank?**
3. **What is your current job?**
4. **Are you a pilot? If yes, please answer the following:**
   If no, skip to question 9.
5. **Where did you attend UPT?**
6. **When?**
7. **What airframes did you train in?**
8. **What is your MWS?**
9. **Is the current Joint Specialized Undergraduate Pilot Training (JSUPT) system providing the MAJCOM a graduate able to meet current RTU requirements?**
10. **If not, why not?**
11. **What are the critical skills required of all JSUPT graduates?**
12. **Rank order the importance of the above skills?**
13. **In your opinion, how many training events would be required to provide the MAJCOM the correct skills required to meet current RTU requirements?**
14. **How long should an optimized pilot training be?**
15. **Will current RTU requirements change as a result of the F-22 and KC-X?**
16. **Are there any other drivers (such as T-38 and T-1 replacement) that favor redesigning JSUPT?**

<u>Definitions</u>:
JSUPT—current pilot training system consisting of primary (T-6) then 4 tracks (T-38, T-1, T-44, UH-1)
Generalized UPT—dual-track system of primary (T-6) then advanced trainer (T-38 or replacement)
Extended T-6 UPT—Single-track system combining primary and advanced training in one platform (T-6)

17. **With the increase in requirements for Special Operations, ISR and UAS platforms, would a specialized, generalized or extended T-6 system best support all the MAJCOMs?**
18. **What are the advantages in cost savings of implementing a generalized UPT system?**
19. **What are the advantages in time savings of implementing a generalized UPT?**
20. **What are the advantages in cost savings of implementing an extended T-6 UPT?**
21. **What are the advantages in time savings of implementing an extended T-6 UPT?**
22. **What are the advantages of maintaining the current JSUPT system?**
23. **What are the disadvantages of implementing a generalized UPT system?**
24. **What are the disadvantages of an extended T-6 UPT?**

25. **What are the disadvantages of maintaining the current JSUPT system?**
26. **Are there any other potential UPT systems that would better serve the USAF?**
27. **If the T-6 program were expanded to include winging, what (if any) "top-off" would be required of T-38/T-1/T-44 training or could newly winged students go straight to their RTUs?**
28. **Are there any other potential reengineering areas in the current JSUPT system not mentioned already?**

Appendix B: List of Symbols, Abbreviations and Acronyms

AFB	Air Force Base
AFI	Air Force Instruction
AFSO21	Air Force Smart Operations for the 21st Century
AETC	Air Education and Training Command
BPR	Business Process Reengineering
CAF	Combat Air Forces
HAF	Headquarters Air Force
IFF	Introduction to Fighter Fundamentals
IFS	Initial Flight Screening
ISR	Intelligence, surveillance and reconnaissance
JSUPT	Joint Specialized Undergraduate Pilot Training
MAF	Mobility Air Forces
MAJCOM	Major Command
NAS	Naval Air Station
SME	Subject Matter Experts
SUPT	Specialized Undergraduate Pilot Training
T-X	Term for future T-38 replacement aircraft acquisition
T-1	Advanced tanker/transport trainer
T-6	Current primary USAF trainer
T-34	Current primary USN trainer
T-37	Past primary USAF trainer
T-38	Advanced fighter/bomber trainer
T-44	Advanced C-130 lead-in trainer
UAS	Unmanned Aerial Systems
UH-1	Army helicopter trainer
UPT	Undergraduate Pilot Training

Bibliography

Air Force Smart Operations for the 21st Century Playbook. Version 1.2. Washington: GPO, December 2006.

Air Force Smart Operations for the 21st Century CONOPS. Version 1.0. Washington: GPO, November 2006.

Aviator Training. Https://www.cnatra.navy.mil/training_pilot.htm, accessed 4 February 2009.

Chief of Staff and Secretary of the Air Force. Memorandum for all MAJCOM Commanders. Washington D. C. 7 November 2005.

Emmons, Richard. Air Education and Training Command History 2006-2007, Flying Training Transformation, February 2009.

Emmons, Richard. Specialized Undergraduate Pilot Training and the Tanker-Transport Training System. History and Research Office, Headquarters Air Training Command, July 1991.

Hammer, Michael and Champy, James. Reengineering the Corporation. New York: HarperCollins, 2003.

Israeli Air Force: the Official Website. Http://www.iaf.org.il/Templates/Aircraft/Aircraft.IN.aspx?lang=EN&lobbyID=69&folderID=81&docfolderID=901&docID=20575&currentPageNumber=6, accessed 23 Feb 09.

Lunsford, Glenn. Aircrew Training Transformation, AETC/A3FI, briefing, January 2008.

PC-21 Turboprop Trainer. http://www.airforce-technology.com/projects/pc_21/, accessed 24 Feb 09.

Pilot Selection and Training. Http://www.nationmaster.com/encyclopedia/Israeli-Air-Force, accessed 23 Feb 09

Steckbeck, Jonathan. Headquarters Air Force, A9, Studies and Analysis. Washington D. C. Telephone Interview, 9 Oct 08.

T-6 Texan II. http://www.af.mil/factsheets/factsheet.asp?fsID=124, accessed 24 Feb 09.

Training Aircraft. Http://www.globalsecurity.org/military/systems/aircraft/training.htm, accessed 10 November 2008.

Womack, James P. and Daniel T. Jones. *Lean Thinking.* New York: Free Press, 2003.

Form Approved
OMB No. 074-0188

REPORT DOCUMENTATION PAGE

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From – To)*
02-06-2009	Master's Thesis	May 2008 – June 2009

4. TITLE AND SUBTITLE
Reengineering Joint Specialized Undergraduate Pilot Training

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHOR(S)

Hauck, David R., Major, USAF

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES(S) AND ADDRESS(S)
Air Force Institute of Technology
Graduate School of Engineering and Management (AFIT/EN)
2950 Hobson Street, Building 642
WPAFB OH 45433-7765

8. PERFORMING ORGANIZATION REPORT NUMBER
AFIT/GOA/ENS/09-2

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
ASC/QI
Attn: Dr. William Cunningham
1865 4th Street
WPAFB OH 45433-7765 DSN 785-6565

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
APPROVED FOR PUBLIC RELEASE; DISTRIBUTION LIMITED

13. SUPPLEMENTARY NOTES

14. ABSTRACT The purpose of the following research was to identify shortfalls in the current USAF joint specialized undergraduate pilot training (JSUPT) system and illustrate potential reengineering alternatives for future training programs to provide the United States Air Force the best possible graduate pilots. The three alternatives for future training programs included the current program (JSUPT), an extended T-6 only option, and a return to generalized undergraduate pilot training (UPT). After interviewing subject matter experts from various backgrounds in the Air Force, the author recommended returning to a generalized pilot training program. The overriding factors that favored the generalized UPT system included assignment flexibility, product quality, and consolidated logistics support costs. Future research should be directed at defining the requirements of the follow-on T-38 trainer (T-X).

15. SUBJECT TERMS
Joint Specialized Undergraduate Pilot Training (JSUPT), Track Select, Dual Track, Generalized UPT, Business Process Reengineering, AFSO21, Interviews, Subject Matter Experts, Training

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			**Dr William Cunningham,**
U	U	U	UU	53	19b. TELEPHONE NUMBER *(Include area code)* (937) 255- 3636 x4283